fiber and changing the period of the optical fiber grating.

8. (Amended) A method for fabricating an optical fiber grating, the method comprising the steps of:

providing a mask having at least one light transmitting region through which exposure light is transmitted;

directing a light beam on an optical fiber;

orienting a first lens so as to focus the light beam at a perpendicular direction to said optical fiber;

orienting a second lens so as to intercept the focused light beam from said first lens and to diverse the focused light beam along the lengthwise direction of said optical fiber; and,

traversing said second lens along said perpendicular direction so as to change the light image projected along said optical fiber and period of the optical fiber grating through said mask.

REMARKS

Claims 1-7 stand rejected 35 U.S.C. 102(b) as being anticipated by Jang et al., International Publication No. W.O. 00/11509 and Claims 8-11 stand rejected under 35 U.S.C. 102(a) as being anticipated by Kim et al., U.S. Publication Application 2001/0008466 A1. Claims 1-11 are in the application. Claims 1, 5 and 8 are independent.

In response, claims 1, 5 and 8 have been amended to more particularly point out the invention.

Applicant respectfully submits that the pending claims, as amended, are patentable for at least the following reasons.

Amended independent claim 1 is directed an apparatus for fabricating an optical fiber grating, comprising an optical fiber, a light source for projecting light beam at a perpendicular direction to the optical fiber, a mask having an array of elongated openings spaced apart by a predetermined interval period through which the light beam from said light source is transmitted, a lens interposed between said optical fiber and said light source for focusing the light beam; and, a mobile lens, disposed to intercept the focused light beam from said lens, for diverging the focused light beam along the lengthwise direction of said optical fiber and changing the period of the optical fiber grating. Amended independent claim 5 recites similar limitations.

The structure of amended independent claims 1 and 5 provide significant advantages in optical fiber grating fabrication devices. The invention allows for a reduction in the diffraction effect produced by the mask used in connection with the fabrication of fiber gratings, thereby preventing the deterioration of the spectrum characteristics of the fiber gratings that might otherwise occur. In particular, in conventional optical fiber grating fabrication devices, as a mask moves away from the optical fiber depending on the desired periods of fiber gratings, diffraction effects occur. Specifically, when a mask moves, it results in deterioration of the contrast of the light (difference of the light intensity between an exposed region and a non-exposed region on

the mask). Thus, the resolution is degraded and the transfer of a fine pattern becomes difficult.

Jang, as read by the applicants, relates to an apparatus for manufacturing a long-period fiber grating, having a light source, mirror, lens for focusing the laser light, a dispersing unit for dispersing the laser light, and an amplitude mask.

Jang fails to teach, show or suggest a mobile lens, disposed to intercept the focused light beam from said lens; for diverging the focused light beam along the lengthwise direction of said optical fiber and changing the period of the optical fiber grating, as specifically recited in amended claim 1.

The Office Action indicates Jang, in figure 1, teaches, "a mobile lens, disposed to intercept the focused light beam from said lens, for diverging the focused light beam along the lengthwise direction of said optical fiber and changing the period of the optical fiber grating." Applicants respectfully disagree. Jang, in figure 1, shows a mobile amplitude mask 108, wherein controller 118 controls the period of the long-period fiber grating by adjusting the position of the amplitude mask 108..., see page 6, lines 23-26; and FIG. 3; page 7, lines 6-7. Further, as indicated page 7, lines "it is assumed that thee distance between the focus of the concave lens 302 and the amplitude mask 304 is x..." Although, this distance may be adjusted, the concave lens is a fixed distance from the mask and not readily movable, as recited in amended claim 1.

Kim relates to a fabrication method of an apodized optical fiber grating. The method according to the invention uses an ultraviolet light source for outputting an ultraviolet layer, a lens field for converging or emitting the light incident from the ultraviolet light source, an amplitude mask for selectively transmitting the ultraviolet

layer incident from the lens field, and an optical fiber, on which the light that has transmitted the amplitude mask. Accordingly, the method includes a first step of setting a cycle of the optical fiber grating formed on the optical fiber and a width of each stripe pattern, a second step of setting a longitudinal ratio, which is a ratio of the distance between the converging or emitting point of the lens field and the amplitude mask to the distance between the converging or emitting point of the lens field and the optical fiber, a third step of setting a cycle of the amplitude mask so as to unify a transverse ratio, which is a ratio of the cycle of the amplitude mask to the cycle of the optical fiber grating, with the longitudinal ratio set in the second step, and a fourth step of setting a thickness of the amplitude mask so as to match the pattern of the optical fiber grating set in the first step with the pattern of an optical distribution on the injecting surface of the mask.

Kim fails to teach, show or suggest the specific steps of orienting a first lens so as to focus the light beam at a perpendicular direction to said optical fiber, orienting a second lens so as to intercept the focused light beam from said first lens and to diverse the focused light beam along the lengthwise direction of said optical fiber; and, traversing said second lens along said perpendicular direction so as to change the light image projected along said optical fiber and period of the optical fiber grating through said mask, as recited in independent claim 8.

Kim, in FIG. 3, shows a lens field 32 that includes a plain-convex lens 34 and a plain-concave lens 35 spaced apart by length d1. When the light is emitted from the ultraviolet source 31 through the lens field 32, the light emitted from the ultraviolet light source 31 appears as if the light is generated from a single converging point. In Fig. 6, the length d2 is called the longitudinal ratio, which represents the ratio of the distance

between the converging (or emitting point) of the lens field 32 and the amplitude mask 36, to the distance between the converging (or emitting point) and the optical fiber 37. ~~Which, in turn, is used to eliminate noise, or so-called side lobes, forming an~~ "apodized optical fiber grating."

It is well settled that a reference that does not teach or suggest all of the features of a claimed invention cannot anticipate that invention. Since Jang or Kim does not teach or suggest all of the features of amended independent claims 1, 5 and 8, as recited above, applicant respectfully submits that these claims are allowable and patentable under 35 U.S.C. § 102.

The other claims in this application are each dependent from one or the other of independent claims discussed above and are, therefore, believed allowable and patentable under 35 U.S.C. § 102 for the same reasons.

A review of the other art of record has failed to reveal anything which, in the applicants' opinion, would remedy the deficiencies of the art discussed above as referenced against the claims now present in this application. The claims are, therefore, believed patentable over the art of record.

In view of the foregoing remarks, applicants respectfully request favorable reconsideration and early passage to issue of the present application.

Should the Examiner deem that there are any issues which may be best resolved by telephone, please contact Applicant's undersigned representative at the number listed below. If there are any fees due and owing, please charge Deposit Account No. 502-470.

Respectfully submitted,

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Patent Application of

Inventor(s): Moo-Youn Park Group Art Unit: 2874

Serial No.: 09/911,004 Examiner: Petkovsek, D. J.

Filing Date: July 23, 2001

For: Optical Fiber Grating Fabrication Apparatus for Minimizing Diffraction Effect

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS

Please amend the claims as follows:

1. (Amended) An apparatus for fabricating an optical fiber grating, comprising:

an optical fiber;

a light source for projecting light beam at a perpendicular direction to the optical fiber;

a mask having an array of elongated openings spaced apart by a predetermined interval period through which the light beam from said light source is transmitted;

a lens interposed between said optical fiber and said light source for focusing the light beam; and,

a mobile lens, disposed to intercept the focused light beam from said lens, for diverging the focused light beam along the lengthwise direction of said optical fiber and changing the period of the optical fiber grating.

5. (Amended) An apparatus for fabricating an optical fiber grating, comprising:

an optical fiber;

a light source for projecting light beam at a perpendicular direction to said optical fiber;

an integrated multi-period mask through which the light beam from said light source is transmitted, said mask spaced apart from said optical fiber by a predetermined distance;

a lens interposed between said optical fiber and said light source for focusing the light beam; and,

a movable concave lens, disposed to intercept the focused light beam from said lens, for diverging the focused light beam along the lengthwise direction of said optical fiber and changing the period of the optical fiber grating.

8. (Amended) A method for fabricating an optical fiber grating, the method comprising the steps of:

providing a mask having at least one light transmitting region through which exposure light is transmitted;

directing a light beam on an optical fiber;

orienting a first lens so as to focus the light beam at a perpendicular direction to said optical fiber;

orienting a second lens so as to intercept the focused light beam from said first lens and to diverse the focused light beam along the lengthwise direction of said optical

fiber; and,

traversing said second lens along said perpendicular direction so as to change the light image projected along said optical fiber and period of the optical fiber grating through said mask.